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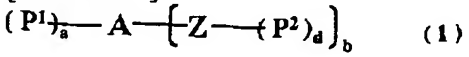
ELECTROPHOTOGRAPHIC PHOTORECEPTOR, PROCESS CARTRIDGE AND ELECTROPHOTOGRAPHIC DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an electorphotographic photoreceptor which is good in sensitivity in spite of formation of a protective layer, is little in an increase of residual potential and small in potential fluctuation by environment at change and makes it possible obtain stable electrophotographic characteristics, a process cartridge having the electrophotographic photoreceptor and an electrophotographic device.
SOLUTION: The electrophotographic photoreceptor which has a conductive substrate, a photosensitive layer and a protective layer, has the protective layer containing a compound polymerized with a hole transferable component having ≧2 chain polymerizable functional groups within the same molecule and has the photosensitive layer containing a charge transfer material of ≧350 in molecular weight, the process cartridge having the electrophotographic photoreceptor and the electrophotographic device.

CLAIMS

[Claim(s)]
[Claim 1] The electrophotography photo conductor characterized by containing the compound which carried out the polymerization of the electron hole transportability compound with which this protective layer has two or more chain pile affinity functional groups in the same molecule in the electrophotography photo conductor which has a conductive base material, a photosensitive layer, and a protective layer, and this photosensitive layer containing with a molecular weight of 350 or more charge transportation material.
[Claim 2] The electrophotography photo conductor according to claim 1 with which the aforementioned photosensitive layer contains with an or more 350 molecular weight [or less 700] charge transportation material.
[Claim 3] The electrophotography photo conductor according to claim 1 or 2 which is more than 50 mass % to all the charge transportation material of the aforementioned charge transportation material that the aforementioned photosensitive layer contains comparatively.
[Claim 4] The electrophotography photo conductor according to claim 1 to 3 whose electron hole transportability compound which has the aforementioned chain pile affinity functional group is the following general formula (1).
[Formula 1]



(A shows an electron hole transportability machine among a formula.) P1 and P2 show a chain pile affinity functional group. Even if P1 and P2 are the same, they may differ. Z shows the organic machine which may have a substituent. a, b, and d show zero or more integers, and a+bxd shows two or more integers. Moreover, when a is two or more, it may differ, even if P1 is the same, and it is d. When it is two or more, even if Z and P2 are the same, they may differ.
[Claim 5] The alkylene machine with which Z of the above-mentioned general formula (1) may have a substituent, the arylene machine which may have a substituent, CR1=CR2 (the alkyl

group in which R1 and R2 may have a substituent --) the aryl group or hydrogen atom which may have a substituent is shown, and even if R1 and R2 are the same, you may differ -- an electrophotography photo conductor given in either of the claims 4 which show one or the organic machine put together arbitrarily from C=O, S=O, SO2, an oxygen atom, or a sulfur atom
[Claim 6] The electrophotography photo conductor according to claim 4 in which Z of the above-mentioned general formula (1) is shown by the following general formula (2).
[Formula 2]

(X1-X3 show among a formula the alkylene machine which may have a substituent, m(CR3=CR4) 1, C=O, S=O, SO2, an oxygen atom, or a sulfur atom, and Ar1-Ar2 show the arylene machine which may have a substituent.) R3 and R4 show the aryl group or hydrogen atom which may have the alkyl group which may have a substituent, and a substituent, and even if R3 and R4 are the same, they may differ. m1 shows the integer of 1-5, and p-t shows the integer of 0-10. However, p-t is not 0 simultaneously.
[Claim 7] The electrophotography photo conductor according to claim 4 in which Z of the above-mentioned general formula (1) is shown by the following general formula (3).
[Formula 3]

(Ar3 shows among a formula the arylene machine which may have a substituent.) X4 and X5 show m (CH2)2, m (CH=CR5)3, C=O, or an oxygen atom. R5 shows the aryl group or hydrogen atom which may have the alkyl group which may have a substituent, and a substituent, in m2, the integer of 1-10 and m3 show the integer of 1-5, and u-w shows the integer of 0-10. However, u-w is not 0 simultaneously.
[Claim 8] The electrophotography photo conductor according to claim 1 to 7 whose oxidation potentials of the compound of an electron hole transportability compound which have two or more chain pile affinity functional groups in the same molecule are 0.4-1.2 (V).
[Claim 9] The electrophotography photo conductor according to claim 4 to 8 in which the electron hole transportability compound which transposed the bonding site of A, and P1 and Z to the hydrogen atom by the above-mentioned general formula (1) is shown by the following general formula (4).
[Formula 4]

(R6, R7, and R8 show among a formula the aryl group which may have the aralkyl machine or substituent which may have the alkyl group which may have a substituent, and a substituent.) However, two show an aryl group before long at least. Moreover, even if R6, R7, and R8 are the same respectively, they may differ.
[Claim 10] The electrophotography photo conductor according to claim 9 which is the aryl group in which R6, R7, and R8 of the above-mentioned general formula (4) may have a substituent.
[Claim 11] The electrophotography photo conductor according to claim 4 to 8 in which the

electron hole transportability compound which transposed the bonding site of A, and P1 and Z to the hydrogen atom by the above-mentioned general formula (1) is shown by the following general formula (5).
[Formula 5]

(R9-R12 show among a formula the aryl group which may have the aralkyl machine or substituent which may have the alkyl group which may have a substituent, and a substituent.) Moreover, even if R9-R12 are the same respectively, they may differ. Ar4 and Ar5 show the arylene machine which may have a substituent, and even if respectively the same, they may differ. m4 shows 0 or 1.
[Claim 12] The electrophotography photo conductor according to claim 11 which m4 of the above-mentioned general formula (5) is 1, and is the aryl group in which R9-R12 may have a substituent.
[Claim 13] The electrophotography photo conductor according to claim 4 to 12 which is the unsaturation polymerization nature functional group both chain pile affinity both [one side or] P1 and P2 are indicated to be by the following general formula (6).
[Formula 6]

the aryl group which may have the alkyl group in which E may have a hydrogen atom, a halogen atom, and a substituent among a formula, and a substituent -- A cyano group, a nitro group, an alkoxy group, and -COOR13{R13 A hydrogen atom, The aryl group which may have the aralkyl machine or substituent which may have a halogen atom, the alkyl group which may have a substituent, and a substituent or -CONR14R15{R14, and R15 A hydrogen atom, The aryl group which may have the aralkyl machine or substituent which may have a halogen atom, the alkyl group which may have a substituent, and a substituent is shown. even if mutually the same -- differing -- **** -- the arylene machine with which it may be shown and W may have a substituent -- The alkylene machine and -COO- which may have a substituent, -CH2-, -O-, - OO- , -S-, or -CONR16-{R16 show aryl group} which may have the aralkyl machine or substituent which may have a hydrogen atom, a halogen atom, the alkyl group that may have a substituent, and a substituent. f shows 0 or 1.
[Claim 14] The electrophotography photo conductor according to claim 4 to 12 both chain pile affinity both [one side or] P1 and P2 are [photo conductor] in any of the following general formula (7) - a general formula (13).
[Formula 7]

[Claim 15] The electrophotography photo conductor according to claim 14 both whose chain pile affinity both [one side or] P1 and P2 are the above-mentioned general formula (7) or a general

formula (8).
[Claim 16] The electrophotography photo conductor according to claim 1 to 15 with which a polymerization is performed by the electron ray.
[Claim 17] The electrophotography photo conductor according to claim 16 whose acceleration voltage of an electron ray is 250kV or less.
[Claim 18] The electrophotography photo conductor according to claim 16 or 17 whose dosage of an electron ray is 1 - 100Mrad.
[Claim 19] The process cartridge characterized by the ability to be able to support to one with at least one means chosen from the group which consists of a development means develop with a toner the electrophotography photo conductor with which an electrification means to electrify this electrophotography photo conductor, and the electrostatic latent image were formed in the electrophotography photo conductor according to claim 1 to 18, and a cleaning means collect the toners which carry out the remainder on the electrophotography photo conductor after an imprint process, and able to detach and attach freely on the main part of electrophotography equipment.
[Claim 20] Electrophotography equipment characterized by having an electrification means to electrify an electrophotography photo conductor according to claim 1 to 18 and this electrophotography photo conductor, an exposure means to be exposed to the electrified electrophotography photo conductor and to form an electrostatic latent image, a development means to develop negatives with a toner to the electrophotography photo conductor with which the electrostatic latent image was formed, and an imprint means to imprint the toner image on an electrophotography photo conductor on imprint material.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the electrophotography photo conductor which contains a specific compound in a surface layer, and contains with a molecular weight of 350 or more charge transportation material in a photosensitive layer in detail, the process cartridge which has the electrophotography photo conductor, and electrophotography equipment about an electrophotography photo conductor, a process cartridge, and electrophotography equipment.
[0002]
[Description of the Prior Art] Conventionally, inorganic photoconductivity material, such as a selenium, a cadmium sulfide, and a zinc oxide, was widely used for the electrophotography photo conductor. On the other hand, as an electrophotography photo conductor using an organic photoconductivity material, they are the photoconductivity polymer represented by Polly N-vinyl caliber ZORU and 2 and 5-screw (p-diethylaminophenyl). - 1, 3, the thing using a low-molecular organic photoconductivity material like 4-OKISA diazole, the thing that combined this organic photoconductivity material, various colors, and pigment are known further.
[0003] Since the electrophotography photo conductor using an organic photoconductivity material is good and membrane formation nature can produce it by coating, it has the advantage which productivity can provide with a cheap high electrophotography photo conductor

extremely. Moreover, it had the advantage with a sensitization wavelength region controllable free by selection of a color, a pigment, etc. to be used, and a broad examination has so far been made. The improvement remarkable in the sensitivity and endurance which carried out the laminating of the charge generating layer which especially contained the organic photoconductivity color and the pigment recently, and the charge transporting bed containing photoconductivity polymer or a low-molecular organic photoconductivity material and which were made the fault of the conventional organic electrophotography photo conductor by development of the electrophotography photo conductor of a functional discrete type is made, and this is becoming in use [an organic electrophotography photo conductor].

[0004] On the other hand, it is required the sensitivity according to the electrophotography process applied to an electrophotography photo conductor with a natural thing, the electrical property, and that it should have the optical property further. If it is in the electrophotography photo conductor by which repeat use is carried out especially, electric and since mechanical force external is applied directly, endurance over them, such as an imprint to electrification, picture exposure, a toner development, and paper and cleaning processing, is required of the electrophotography photo conductor front face. Specifically, surface degradation by the endurance and electrification over the surface wear and generating of a blemish by **** is mentioned, and the fall of imprint efficiency or slipping nature and the endurance over degradation of electrical properties, such as a sensitivity fall and a potential fall, are also required further in more detail.

[0005] Generally, the front face of an electrophotography photo conductor is a thin resin layer, and the property of a resin is very important for it. Although it considers as the resin with which it is satisfied of above-mentioned terms and conditions to some extent and acrylic resin, polycarbonate resin, etc. are put in practical use in recent years, when it is not satisfied [with these resins] of all the properties that were mentioned above and it attains high durability-ization of an electrophotography photo conductor especially, it is hard to say that the coat degree of hardness of this resin is sufficiently high. Even when these resins were used as a resin for surface-layer formation, wear of a surface layer took place repeatedly at the time of use, and there was a trouble that a blemish occurred further.

[0006] Furthermore, although low molecular weight compounds, such as charge transportation material, are added in many cases comparatively in large quantities from the demand to high-sensitivity-izing of an organic electrophotography photo conductor in recent years, film intensity falls remarkably by the operation like a plasticizer of these low-molecular-weight material in this case, and wear and blemish generating of the surface layer at the time of repeat use pose a problem further. Moreover, when saving an electrophotography photo conductor over a long period of time, the above-mentioned low molecular weight constituent deposited, and the problem of carrying out layer separation is also generated.

[0007] As a means to solve these troubles, the attempt which uses the resin of hardenability as a resin for charge transporting beds is indicated by JP,2-127652,A etc. Thus, ******-proof and ****-proof at the time of the increase of a mechanical strength and repeat use improve greatly by using the resin of hardenability for the resin for charge transporting beds, hardening a charge transporting bed and constructing a bridge. However, even if it uses a hardenability resin, since a low molecular weight constituent acts as a plasticizer into a binding resin to the last, the problem of a deposit which was described previously, or layer separation is not fundamental solution.

[0008] Moreover, in the charge transporting bed which consists of an organic charge transportation material and a binding resin, by the time it satisfies both -- charge transportation

ability is not enough and elevation of a rest potential is seen at the time of repeat use -- to a hardenability resin with a degree of hardness high enough greatly [the dependence over the resin of charge transportation ability], it will not have resulted.
[0009] Moreover, it sets to JP,5-216249,A, JP,7-72640,A, etc. Although the electrophotography photo conductor which the charge transfer layer was made to contain the monomer which has a carbon-carbon double bond, was made to react by the carbon-carbon double bond, heat, or luminous energy of charge transfer material, and formed the charge transfer layer hardening film is indicated Since charge transportation material is only fixed by the polymer main skeleton in the shape of a pendant and cannot fully eliminate a previous plastic operation, a mechanical strength is not enough. Moreover, if concentration of charge transportation material is made high for improvement in charge transportation ability, crosslinking density cannot become low and cannot secure sufficient mechanical strength. Furthermore, we are anxious also about the influence on the electrophotography property of initiators needed at the time of a polymerization.
[0010] Moreover, although the electrophotography photo conductor which the basis which has charge transportation ability was introduced [photo conductor] and made the charge transporting bed form into a thermoplastic macromolecule principal chain in JP,8-248649,A etc. as another solution means is indicated although it is effective to a deposit or layer separation as compared with a conventional molecular-dispersion type charge transporting bed and a mechanical strength also improves, it is thermoplastics to the last, and there is a limitation in the mechanical strength and it is hard to say that it enough-comes out in respect of the handling including the solubility of a resin etc., or productivity
[0011] Making into the background what was described above, this invention persons repeated the examination for attaining coexistence of a high mechanical strength and charge transportation ability. Consequently, it was checked that coexistence of a mechanical strength and charge transportation ability is mostly attained with the electrophotography photo conductor containing the compound to which the polymerization of the electron hole transportability compound which has two or more chain pile affinity functional groups in the same molecule was carried out.
[0012] However, although the mechanical strength improved by using the electron hole transportability compound which has two or more chain pile affinity functional groups in the same molecule when this was used as a protective layer, when a photosensitive layer was an organic system photosensitive layer, sensitivity might not fully be obtained and the rise of a rest potential might be seen. Moreover, potential was changed with an environmental change and the stable potential property could not be acquired.
[0013] In order to offer the more excellent electrophotography photo conductor with high-definition-izing in recent years and a raise in durability, these problems surely needed to be solved.
[0014]
[Problem(s) to be Solved by the Invention] Even if the purpose of this invention forms a protective layer, its sensitivity is good, it has few rises of a rest potential, and its potential change by the environmental variation is small, and it is to offer the electrophotography photo conductor with which the stable electrophotography property is acquired.
[0015] Another purpose of this invention is to offer the process cartridge and electrophotography equipment which have the above-mentioned electrophotography photo conductor.
[0016]
[Means for Solving the Problem] The electrophotography photo conductor characterized by containing the compound which carried out the polymerization of the electron hole

transportability compound with which this protective layer has two or more chain pile affinity functional groups in the same molecule in the electrophotography photo conductor which has a conductive base material, a photosensitive layer, and a protective layer according to this invention, and this photosensitive layer containing with a molecular weight of 350 or more charge transportation material is offered.
[0017] Moreover, according to this invention, the process cartridge and electrophotography equipment which have the above-mentioned electrophotography photo conductor are offered.
[0018]
[Embodiments of the Invention] Next, the composition of the electrophotography photo conductor of this invention is explained in detail.
[0019] First, the protective layer in this invention is explained. First, the electron hole transportability compound which has a chain pile affinity functional group is explained.
[0020] The chain polymerization in this invention shows the polymerization-reaction form of the former at the time of roughly dividing the generation reaction of a high polymer into chain polymerization and successive polymerization. It is Gihodo Shuppan Co., Ltd. in detail. As explained to "chemistry [of basic synthetic resin] (new edition)" 1995 year 7 month 25 day (1st edition 8 **) P.24 of three-bird Tadahiro work The form says things, such as an unsaturation polymerization to which a reaction mainly advances via intermediate fields, such as a radical or ion, ring opening polymerization, and isomerization polymerization. In the chain pile affinity functional groups P1 and P2 in the aforementioned general formula (1), although the functional group in which the above-mentioned reaction form is possible is meant, the most is occupied here and the example of the large unsaturation polymerization of the application range or a ring-opening-polymerization nature functional group is shown.
[0021] Although an unsaturation polymerization is a reaction in which an unsaturation machine, for example, C=C, C**C, C=O, C=N, C**N, etc. carry out a polymerization by the radical, ion, etc., it is mainly C=C. Although the example of an unsaturation polymerization nature functional group is shown in Table 1, it is not limited to these.
[0022]
[Table 1]

[0023] Front Naka and R show an aryl group or hydrogen atoms, such as a phenyl group which may have aralkyl machines, such as a benzyl which may have alkyl groups, such as a methyl group which may have a substituent, an ethyl group, a propyl group, and a butyl, and a substituent, a phenethyl machine, a naphthyl methyl group, a furfuryl machine, and a thienyl group, and a substituent, a naphthyl group, and an anthryl machine.
[0024] Although ring opening polymerization is a reaction which repeats a polymerization and generates a chain macromolecule object at the same time it is activated and an unstable cyclic structure with the strain of a ring, an OKUSO ring, a nitrogen heterocycle, etc. carries out ring breakage in an operation of a catalyst, that on which ion acts as active species fundamentally in this case is most. Although the example of a ring-opening-polymerization nature functional group is shown in Table 2, it is not limited to these.
[0025]
[Table 2]

[0026] Front Naka and R show an aryl group or hydrogen atoms, such as a phenyl group which may have aralkyl machines, such as a benzyl which may have alkyl groups, such as a methyl group which may have a substituent, an ethyl group, a propyl group, and a butyl, and a substituent, a phenethyl machine, a naphthyl methyl group, a furfuryl machine, and a thienyl group, and a substituent, a naphthyl group, and an anthryl machine.
[0027] Also in the chain pile affinity functional group concerning this invention which was explained above, what is shown by the following general formula (6), (14), and (15) is desirable.
[0028]
[Formula 8]

[0029] The methyl group in which E may have halogen atoms, such as a hydrogen atom, a fluorine, chlorine, and a bromine, and a substituent among a formula, The benzyl which may have alkyl groups, such as an ethyl group, a propyl group, and a butyl, and a substituent, Aralkyl machines, such as a phenethyl machine, a naphthyl methyl group, a furfuryl machine, and a thienyl group, Alkoxy groups, such as aryl groups, such as the phenyl group and naphthyl group which may have a substituent, an anthryl machine, a pyrenyl machine, a thiophenyl machine, and a furil machine, a methoxy machine, an ethoxy basis, and a propoxy group, CN basis, a nitro group, -COOR13, or -CONR 14R15 is shown.
[0030] W is shown by alkylene machines, such as arylene machines, such as a phenylene group which may have a substituent, a naphthylene machine, and an anthracenylene group, a methylene group which may have a substituent, an ethylene, and a butylene, -COO-, -CH2-, -O-, -OO-, -S-, or -CONR16-.
[0031] R13, R14, R15, and R16 show aryl groups, such as the phenyl group and naphthyl group which may have an aralkyl machine or substituents, such as a benzyl which may have alkyl groups, such as a methyl group which may have halogen atoms, such as a hydrogen atom, a fluorine, chlorine, a bromine, and iodine, and a substituent, an ethyl group, a propyl group, and a butyl, and a substituent, and a phenethyl machine, and an anthryl machine, and even if R14 and R15 are mutually the same, Moreover, f shows 0 or 1.
[0032] As a substituent which you may have in E and W, halogen atom; nitro groups, such as a fluorine, chlorine, a bromine, and iodine, Alkyl groups, such as a cyano group, a hydroxyl-group; methyl group, an ethyl group, a propyl group, and a butyl; A methoxy machine, alkoxy-groups [, such as an ethoxy basis and a propoxy group,]; -- aryloxy group [, such as a phenoxy machine and a naphthoxy machine,]; -- a benzyl -- Aryl groups, such as aralkyl machine [, such as a phenethyl machine, a naphthyl methyl group, a furfuryl machine and a thienyl group,]; or a phenyl group, a naphthyl group, an anthryl machine, and a pyrenyl machine, etc. are mentioned.
[0033]
[Formula 9]

[0034] R17 and R18 show among a formula aryl groups, such as a phenyl group, a naphthyl group, etc. which may have aralkyl machines, such as a benzyl which may have alkyl groups, such as a methyl group which may have a hydrogen atom and a substituent, an ethyl group, a propyl group, and a butyl, and a substituent, and a phenethyl machine, or a substituent, and n shows the integer of 1-10.

[0035]
[Formula 10]

R19 and R20 show among a formula aryl groups, such as a phenyl group, a naphthyl group, etc. which may have aralkyl machines, such as a benzyl which may have alkyl groups, such as a methyl group which may have a hydrogen atom and a substituent, an ethyl group, a propyl, and a butyl, and a substituent, and a phenethyl machine, or a substituent, and n shows the integer of 0-10.
[0036] As a substituent which R17, R18, R19, and R20 of (14) of the above-mentioned general formula and (15) may have, in addition, a fluorine, Alkyl groups, such as halogen atom; methyl groups, such as chlorine, a bromine, and iodine, an ethyl group, a propyl group, and a butyl; A methoxy machine, alkoxy-groups [, such as an ethoxy basis and a propoxy group,]; -- aryloxy group [, such as a phenoxy machine and a naphthoxy machine,]; -- a benzyl -- Aryl groups, such as aralkyl machine [, such as a phenethyl machine, a naphthyl methyl group, a furfuryl machine and a thienyl group,]; or a phenyl group, a naphthyl group, an anthryl machine, and a pyrenyl machine, etc. are mentioned.
[0037] Moreover, as a still more desirable chain pile affinity functional group, what is shown by the following general formula (7) - the general formula (13) is mentioned also in the above-mentioned general formula (6), (14), and (15).
[0038]
[Formula 11]

[0039] Furthermore, the acryloyloxy machine of a general formula (7) and the methacryloyloxy machine of a general formula (8) are especially the most desirable from points, such as a polymerization property, also in the above-mentioned general formula (7) - a general formula (13).
[0040] Next, the electron hole transportability material in this invention is explained.
[0041] "The electron hole transportability compound which has a chain pile affinity functional group" shows two or more compounds which are carrying out the chemical bond to the electron hole transportability compound which the chain pile affinity functional group explained above explains below preferably as a functional group by this invention. In this case, even if all of those chain pile affinity functional groups are the same, they may differ.
[0042] As an electron hole transportability compound which has those two or more chain pile affinity functional groups, the case where it is the following general formula (1) is desirable.
[0043]
[Formula 12]

[0044] A shows an electron hole transportability machine among a formula. P1 and P2 show a chain pile affinity functional group. Even if P1 and P2 are the same, they may differ. Z shows the organic machine which may have a substituent. a, b, and d show zero or more integers, and a+bxd shows two or more integers. Moreover, when a is two or more, it may differ, even if P1 is

the same, and it is d. When it is two or more, even if Z and P2 are the same, they may differ.
[0045] You may differ, even if P1 is the same here, when "a is two or more. in addition, with " They are n kinds of chain pile affinity functional groups different, respectively P11, P12, P13, P14, and P15 .... When it is indicated as P1n, for example, all three polymerization nature functional groups P1 coupled directly with the electron hole transportability compound A at the time of a= 3 the same thing That (for example, P11, and P11 and P12) from which two are the same as and one is different it means that a thing (for example, P12, and P15 and P17) different three, respectively may be used (when "d is two or more, even when P2 is the same -- you may differ -- " -- that is,) It means that it is the same as that of "they differing even if Z and P2 are the same when b is two or more", that is, this.
[0046] The electron hole transportation compound which transposed the bonding site with A, P1, and Z of the above-mentioned general formula (1) to the hydrogen atom For example, an oxazole derivative, an OKISA diazole derivative, an imidazole derivative, Triaryl amine derivatives, such as a triphenylamine, 9-(p-diethylaminostyryl) anthracene, A 1 and 1-screw-(4-dibenzyl aminophenyl) propane, a styryl anthracene, A styryl pyrazoline, phenylhydrazones, a thiazole derivative, a triazole derivative, a phenazine derivative, an acridine derivative, a benzofuran derivative, a bends imidazole derivative, a thiophene derivative, N-phenyl carbazole derivative, etc. are mentioned.
[0047] Furthermore, what is the condensation heterocycle which has the basis shown by the compound shown also in the above-mentioned electron hole transportation compound by the formula chosen from the following general formula (4), (5), (16), (17), and (19), the condensed-ring hydrocarbon which has the basis shown by the following general formula (18), or the following general formula (18) is desirable. Furthermore, especially the case where it is the compound shown by the general formula (4) and (5) also in it is desirable.
[0048]
[Formula 13]

[0049] The methyl group in which R6, R7, and R8 may have a substituent among the above-mentioned general formula (4), A ten or less carbon numbers [, such as an ethyl group, a propyl group, and a butyl,] alkyl group, The benzyl which may have a substituent, a phenethyl machine, a naphthyl methyl group, The phenyl group which may have an aralkyl machine or substituents, such as a furfuryl machine and a thienyl group A naphthyl group, an anthryl machine, a phenan thrill machine, a pyrenyl machine, a thiophenyl machine, Aryl groups, such as a furil machine, a pyridyl machine, a quinolyl machine, a benzo quinolyl machine, a carbazolyl machine, a phenothiazinyl group, a benzo furil machine, a benzo thiophenyl machine, a dibenzo furil machine, and a dibenzo thiophenyl machine, are shown.
[0050] However, at least two of R6, R7, and R8 show an aryl group, and even if R6, R7, and R8 are the same respectively, they may differ. Furthermore, especially the thing whose all of R6, R7, and R8 are aryl groups also in it is desirable. Moreover, among R6 of the above-mentioned general formula (4), R7, or R8, arbitrary two may be combined through a direct or joint machine, respectively, and a hetero atom or CH=CH bases, such as alkylene machines, such as a methylene group, an ethylene, and a propylene machine, an oxygen atom, and a sulfur atom, etc. are mentioned as the joint machine.
[0051]
[Formula 14]

[0052] Among the above-mentioned general formula (5), m4 shows 0 or 1 and its case where it is m4=1 is desirable. A ten or less carbon numbers [, such as a methyl group in which R9-R12 may have a substituent, an ethyl group, a propyl group, and a butyl,] alkyl group, The benzyl which may have a substituent, a phenethyl machine, a naphthyl methyl group, The phenyl group which may have an aralkyl machine or substituents, such as a furfuryl machine and a thienyl group A naphthyl group, an anthryl machine, a phenan thrill machine, a pyrenyl machine, a thiophenyl machine, Aryl groups, such as a furil machine, a pyridyl machine, a quinolyl machine, a benzo quinolyl machine, a carbazolyl machine, a phenothiazinyl group, a benzo furil machine, a benzo thiophenyl machine, a dibenzo furil machine, and a dibenzo thiophenyl machine, are shown, and even if R9-R12 are the same respectively, they may differ.
[0053] the arylene machine (benzene and naphthalene --) with which Ar4 may have a substituent An anthracene, a phenanthrene, a pyrene, a thiophene, a furan, a pyridine, A quinoline, a benzo quinoline, a carbazole, a phenothiazin, a benzofuran, The basis which removed two hydrogen atoms from benzothiophene, the dibenzofuran, the dibenzo thiophene, etc. is shown. In the case of m4=0, Ar5 A phenyl group, a naphthyl group, an anthryl machine, A phenan thrill machine, a pyrenyl machine, a thiophenyl machine, a furil machine, a pyridyl machine, Aryl groups, such as a quinolyl machine, a benzo quinolyl machine, a carbazolyl machine, a phenothiazinyl group, a benzo furil machine, a benzo thiophenyl machine, a dibenzo furil machine, and a dibenzo thiophenyl machine, are shown, and, in the case of m4=1, the same arylene machine as the above Ar1 is shown. In addition, in the case of m4=1, even if Ar4 and Ar5 are the same, you may differ.
[0054] Furthermore, also in it, especially the case where all four R9-R12 in the above-mentioned general formula (5) are all an aryl group is desirable. Moreover, although R9 and R10 of the above-mentioned general formula (5), R11 and R12, or Ar4 and Ar5 may be combined through a direct or joint machine, respectively and a hetero atom or CH=CH bases, such as alkylene machines, such as a methylene group, an ethylene, and a propylene machine, a carbonyl group, an oxygen atom, and a sulfur atom, etc. are mentioned as the joint machine, in these, an alkylene machine is desirable.
[0055]
[Formula 15]

[0056] The methyl group in which R21, R22, R23, and R24 may have a substituent among the above-mentioned general formula (16), A ten or less carbon numbers [, such as an ethyl group, a propyl group, and a butyl,] alkyl group, The benzyl which may have a substituent, a phenethyl machine, a naphthyl methyl group, The phenyl group which may have an aralkyl machine or substituents, such as a furfuryl machine and a thienyl group A naphthyl group, an anthryl machine, a phenan thrill machine, a pyrenyl machine, a thiophenyl machine, A furil machine, a pyridyl machine, a quinolyl machine, a benzo quinolyl machine, a carbazolyl machine, Aryl groups, such as a phenothiazinyl group, a benzo furil machine, a benzo thiophenyl machine, a dibenzo furil machine, and a dibenzo thiophenyl machine, are shown, and even if R21, R22, R23, and R24 are the same respectively, they may differ. A ten or less carbon numbers [, such as a methylene group, an ethylene a propylene machine, etc. with which R25 and R26 may have a substituent,] alkylene machine, or the arylene machine (benzene, naphthalene, and an anthracene

--) which may have a substituent A phenanthrene, a pyrene, a thiophene, a furan, a pyridine, a quinoline, The basis which removed two hydrogen atoms from a benzo quinoline, a carbazole, a phenothiazin, a benzofuran, benzothiophene, the dibenzofuran, the dibenzo thiophene, etc. is shown, and even if R25 and R26 are the same, they may differ. Q shows the organic machine which may have a substituent.

[0057] Furthermore, also in it, it is the aryl group in which at least two of R21, R22, R23, and R24 in the above-mentioned general formula (16) may have a substituent, and the case where it is the arylene machine with which R25 and R26 may have a substituent is desirable, and especially the case where R21, R22, R23, and all four R 24 are all the aryl groups which may have a substituent further is desirable. Moreover, among R21, R22, and R25 of the above-mentioned general formula (16), arbitrary two may be combined through a direct or joint machine, respectively, and a hetero atom or CH=CH bases, such as alkylene machines, such as a methylene group, an ethylene, and a propylene machine, an oxygen atom, and a sulfur atom, etc. are mentioned as the joint machine among arbitrary two, or R23, R24 and R26.

[0058]

[Formula 16]

[0059] However, at least one of R27, R28, and Ar6 has at least one basis shown by the following general formula (18).

[0060]

[Formula 17]

[0061] The phenyl group in which Ar6 and Ar7 may have a substituent among the above-mentioned general formula (17) and (18), A naphthyl group, an anthryl machine, a phenan thrill machine, a pyrenyl machine, a thiophenyl machine, A furil machine, a pyridyl machine, a quinolyl machine, a benzo quinolyl machine, a carbazolyl machine, Aryl groups, such as a phenothiazinyl group, a benzo furil machine, a benzo thiophenyl machine, a dibenzo furil machine, and a dibenzo thiophenyl machine, are shown. The methyl group in which R27, R28, R29, and R30 may have a substituent, A ten or less carbon numbers [, such as an ethyl group, a propyl group and a butyl,] alkyl group, The benzyl which may have a substituent, a phenethyl machine, a naphthyl methyl group, Aralkyl machines, such as a furfuryl machine and a thienyl group, the phenyl group which may have a substituent, A naphthyl group, an anthryl machine, a phenan thrill machine, a pyrenyl machine, a thiophenyl machine, A furil machine, a pyridyl machine, a quinolyl machine, a benzo quinolyl machine, a carbazolyl machine, Aryl groups, such as a phenothiazinyl group, a benzo furil machine, a benzo thiophenyl machine, a dibenzo furil machine, and a dibenzo thiophenyl machine, are shown, and, in addition to these alkyl groups, an aralkyl machine, and an aryl group, R29 and R30 show a hydrogen atom. Furthermore, even if R27, R28, and R29 and R30 are the same respectively, they may differ.

[0062] Moreover, among R27, R28, or Ar6, arbitrary two, or Ar7 and R30 may be combined through a direct or joint machine, respectively, and a hetero atom or CH=CH bases, such as alkylene machines, such as a methylene group, an ethylene, and a propylene machine, an oxygen atom, and a sulfur atom, etc. are mentioned as the joint machine. n1 shows the integer of 0-2. In addition, the case where R30 is an aryl group also in it is desirable, and especially the case where R27 and R28 are aryl groups further is desirable.

[0063] Furthermore, as a compound which has the basis shown by the above-mentioned general formula (18), condensation heterocycles, such as the benzofuran machine which may have a condensed-ring hydrocarbon or substituents, such as the naphthalene machine which may have a substituent, an anthracene machine, a phenanthrene machine, a PEREN machine, a fluorene machine, a full ORANSEN machine, an azulene machine, an indene machine, a perylene machine, a chrysene machine, and a coronene machine, the Indore machine, a carbazol group, a bends carbazole machine, an acridine
[0064]
[Formula 18]

[0065] However, the above-mentioned general formula (19) has at least one basis shown by the following general formula (20).
[0066]
[Formula 19]

[0067] The phenyl group in which Ar8, Ar9, and Ar10 may have a substituent among the above-mentioned general formula (19) and (20), A naphthyl group, an anthryl machine, a phenan thrill machine, a pyrenyl machine, a thiophenyl machine, A furil machine, a pyridyl machine, a quinolyl machine, a benzo quinolyl machine, a carbazolyl machine, Aryl groups, such as a phenothiazinyl group, a benzo furil machine, a benzo thiophenyl machine, a dibenzo furil machine, and a dibenzo thiophenyl machine, are shown. The methyl group, ethyl group in which R31, R32, and R33 may have a substituent, The benzyl which may have a ten or less carbon numbers [, such as a propyl group and a butyl,] alkyl group and a substituent, Aralkyl machines, such as a phenethyl machine, a naphthyl methyl group, a furfuryl machine, and a thienyl group, The phenyl group and naphthyl group which may have a substituent, an anthryl machine, a phenan thrill machine, A pyrenyl machine, a thiophenyl machine, a furil machine, a pyridyl machine, a quinolyl machine, A benzo quinolyl machine, a carbazolyl machine, a phenothiazinyl group, a benzo furil machine, Aryl groups, such as a benzo thiophenyl machine, a dibenzo furil machine, and a dibenzo thiophenyl machine, are shown, and, in addition to these alkyl groups, an aralkyl machine, and an aryl group, R32 and R33 show a hydrogen atom. In addition, even if Ar8 and Ar9, and R32 and R33 are the same respectively, they may differ.
[0068] Also in it, the case where R31 and R32 are aryl groups is desirable. Moreover, among R31, Ar8, or Ar9, arbitrary two, or Ar10 and R33 may be combined through a direct or joint machine, respectively, and a hetero atom or CH=CH bases, such as alkylene machines, such as a methylene group, an ethylene, and a propylene machine, an oxygen atom, and a sulfur atom, etc. are mentioned as the joint machine. n2 shows the integer of 0-2.
[0069] Moreover, the alkylene machine with which Z in the above-mentioned general formula (1) and Q in the above-mentioned general formula (16) may have a substituent, One or the organic machine put together arbitrarily is shown from the arylene machine and CR1=CR2 (R1 and R2 show an alkyl group, an aryl group, or a hydrogen atom, and even if R1 and R2 are the same, they may differ) which may have a substituent, C=O, S=O, SO2, an oxygen atom, or a sulfur atom. What is shown by the following general formula (2) also in it is desirable, and especially the thing shown by the following general formula (3) is desirable.
[0070]

[Formula 20]

[0071]
[Formula 21]

[0072] The methylene group in which X1-X3 may have a substituent among the above-mentioned general formula (2), A 20 or less carbon numbers [, such as an ethylene and a propylene machine,] alkylene machine, m(CR3=CR4) 1, C=O, the arylene machine (benzene --) with which S=O, SO2, an oxygen atom, or a sulfur atom may be shown, and Ar1 and Ar2 may have a substituent Naphthalene, an anthracene, a phenanthrene, a pyrene, a thiophene, The basis which removed two hydrogen atoms from a furan, a pyridine, a quinoline, a benzo quinoline, a carbazole, a phenothiazin, a benzofuran, benzothiophene, the dibenzofuran, the dibenzo thiophene, etc. is shown. R<SUP> 3 and R4 show an aryl group or hydrogen atoms, such as a phenyl group which may have alkyl groups, such as a methyl group which may have a substituent, an ethyl group, a propyl group, and a butyl, and a substituent, a naphthyl group, and a thiophenyl machine, and even if R3 and R4 are the same, they may differ. m1 shows the integer of 1-5, and p-t shows the integer of 0-10 (however, p-t is not 0 simultaneously).
[0073] X4 and X5 show m (CH2)2, m (CH=CR5)3, C=O, or an oxygen atom among the above-mentioned general formula (3), and Ar3 shows the arylene machine (basis which removed two hydrogen atoms from benzene, naphthalene, an anthracene, a phenanthrene, a pyrene, a thiophene, a furan, a pyridine, a quinoline, a benzo quinoline, a carbazole, a phenothiazin, a benzofuran, benzothiophene, the dibenzofuran, the dibenzo thiophene, etc.) which may have R5 shows an aryl group or hydrogen atoms, such as a phenyl group which may have alkyl groups, such as a methyl group which may have a substituent, an ethyl group, a propyl group, and a butyl, and a substituent, a naphthyl group, and a thiophenyl machine. In m2, the integer of 1-10 and m3 show the integer of 1-5, and u-w shows the integer of 0-10 (especially the time especially of the integer of 0-5 is desirable.). However, u-w is not 0 simultaneously.
[0074] As a substituent which R1-R5 of above-mentioned general formula (1) - (3), (5), (6), and (14) - (20), R9-R33, Ar1-Ar10, X1-X5, and Z and Q may have, respectively, in addition, a fluorine, Halogen atom; nitro groups, such as chlorine, a bromine, and iodine, a cyano group, a hydroxyl group; A methyl group, Alkoxy groups, such as alkyl group; methoxy machines, such as an ethyl group, a propyl group, and a butyl, an ethoxy basis, and a propoxy group; A phenoxy machine, aryloxy group [, such as a naphthoxy machine,]; -- aralkyl machines, such as a benzyl, a phenethyl machine, a naphthyl methyl group, a furfuryl machine, and a thienyl group, -- aryl groups, such as; phenyl group, a naphthyl group, an anthryl machine, and a pyrenyl machine, are mentioned Moreover, as a substituent which R6-R8 of a general formula (4) may have, diaryl amino groups, such as the above-mentioned substituent except the aryl group, a diphenylamino machine, and a JI (p-tolyl) amino group, are mentioned.
[0075] Moreover, as for the electron hole transportability compound which has one or more chain pile affinity functional groups in the same molecule in this invention, it is desirable that an oxidation potential is below 1.2 (V), and it is especially desirable that it is 0.4-1.2 (V). That pouring of the charge (electron hole) from charge generating material cannot take place easily if an oxidation potential 1.2 (V) Exceeds it Elevation of a rest potential, It is easy to produce problems, like sensitivity aggravation and the potential change at the time of repeat use become

large. Moreover, it is to become easy to produce problems, like the sensitivity aggravation which was easy to deteriorate in order for the compound itself [other than problems such as a fall of electrification ability,] to oxidize easily, and originated in it, picture dotage, and the potential change at the time of repeat use become large under in 0.4 (V).
[0076] In addition, the oxidation potential described here is measured by the following methods.
[0077] (Measuring method of an oxidation potential) The saturated calomel electrode was made into the reference electrode, the 0.1-N(n-Bu) 4 N+ClO4-acetonitrile solution was used for the electrolytic solution, and potential when the sweep of the potential impressed to a working electrode (platinum) by the potential sweeper is carried out and the obtained current potential curve shows a peak was made into the oxidation potential. In detail, a sample is dissolved in a 0.1-N(n-Bu) 4 N+ClO4-acetonitrile solution so that it may become about [5-10mmol%] concentration. And voltage is applied by the working electrode at this sample solution, the current change when changing voltage from low voltage (0V) to high potential (+1.5V) linearly is measured, and a current potential curve is obtained. In this current potential curve, potential of the position of the peak top when current value shows a peak (it is the first peak when there are two or more peaks) was made into the oxidation potential.
[0078] Furthermore, that in which the electron hole transportability compound which has the above-mentioned chain pile affinity functional group has the drift mobility more than 1x10-7 (cm2/V.sec) as electron hole transportation ability is desirable (however, impression electric-field:5x104 V/cm). Under in 1x10-7 (cm2/V.sec), since an electron hole cannot fully move by after [exposure] development as an electrophotography photo conductor, sensitivity may decrease seemingly, and the problem to which a rest potential also becomes high may occur.
[0079] Although the example of representation of the electron hole transportability compound which has a chain pile affinity functional group concerning this invention is given to below, it is not limited to these.
[0080]
[Formula 22]

[0169] In this invention, it is carrying out the polymerization of the electron hole transportability compound which has two or more chain pile affinity functional groups in the same aforementioned molecule, and the compound which has electron hole transportation ability forms the 3-dimensional structure of cross linkage with two or more points constructing a bridge into a protective layer. any of the aforementioned electron hole transportability compound carrying out the polymerization only of it, or mixing it with the compound which has other chain pile affinity functional groups -- although -- it is possible and the whole of its kind / ratio is arbitration being mentioned here -- others -- either the monomer which has a chain pile affinity functional group with the compound which has a chain pile affinity functional group, or oligomer/polymer -- although -- it is contained
[0170] A basis with same functional group of an electron hole transportability compound and functional group of other chain pile affinity compounds, or when it is the basis in which a polymerization is possible mutually, both can take the 3-dimensional copolymerization structure of cross linkage through covalent bond. Although a protective layer is constituted as what contained other chain pile affinity compound monomer or its hardened material in the mixture of two or more 3-dimensional hardened materials, or the 3-dimensional hardened material of a principal component when both functional group is a functional group which does not carry out a

polymerization mutually, it is controlling well its rate of a compounding ratio / the film production method, and it is also possible to form IPN (Inter Penetrating Network), i.e., the mutual penetration network structure.

[0171] Moreover, you may form a protective layer from the monomer which has the aforementioned electron hole transportability compound and polymerization nature machines other than a chain pile affinity functional group, or oligomer/polymer. Moreover, you may contain a ** agent and others, such as other various additives and a fluorine atom content resin particle.

[0172] In this invention, the polymerization of the electron hole transportability compound which has a chain pile affinity functional group can be carried out according to light, such as heat, the light, and ultraviolet rays, and also radiation. Therefore, depending on the electron hole transportability compound and the need of having the aforementioned chain pile affinity functional group, formation of the protective layer in this invention makes the coating liquid for protective layers contain a polymerization initiator, and carries out the polymerization of the electron hole transportability compound which has this chain pile affinity functional group to the coating film formed using this coating liquid by irradiating light or radiation. In addition, in this invention, it is desirable to carry out the polymerization of the electron hole transportability compound which has this chain pile affinity functional group according to radiation also in it. The greatest advantage of the polymerization by radiation is a point which does not need a polymerization initiator, and is a point that become producible [a thereby very high grade 3-dimensional protective layer], and good endurance is secured. Moreover, it is a short time, and although it is efficient polymerization reaction therefore, productivity is also high, and it is further mentioned from the penetrable goodness of radiation that the influence of the hardening prevention at the time of shielding material, such as the time of a thick film and an additive, existing in a film is very small etc. However, addition of the polymerization initiator within the limits which polymerization reaction may be unable to advance easily depending on the kind of chain pile affinity functional group or the kind of os-centrale rank, and do not have influence in that case is possible. Under the present circumstances, an electron ray is especially desirable although the radiation to be used is an electron ray and a gamma ray.

[0173] When carrying out electron beam irradiation, as an accelerator, a scanned type, an electro curtain type, a broad-beam type, a pulse type, a lamina type, etc. can use any form. Irradiation conditions are very important, when irradiating an electron ray and making an electrical property discover in the electrophotography photo conductor of this invention. In this invention, 250kV or less of acceleration voltage is desirable, and it is 150kV or less the optimal. moreover, dosage -- desirable -- the range of 1Mrad - 100Mrad -- it is the range of 3Mrad(s) - 50Mrad more preferably When acceleration voltage exceeds 250kV, it is in the inclination which the damage of the electron beam irradiation to a photo conductor property increases. Moreover, since hardening is easy to become inadequate, and degradation of a photo conductor property tends to take place in [than dosage 100Mrad] more when there is less quantity of radiation than 1Mrad, cautions are required.

[0174] More than 20 mass % of the hydrogenation object of the electron hole transportability machine A which has the chain pile affinity functional group shown by the aforementioned general formula (1) to the total mass of the protective-layer film after polymerization hardening is desirable, and, as for the amount of the aforementioned electron hole transportability compound, it is desirable to contain more than 40 mass % especially. Charge transportation ability falls that it is under 20 mass %, and it is easy to produce troubles, such as a sensitivity fall

and elevation of a rest potential. The thickness as a protective layer in this case has desirable 0.1-10 micrometers, and its 0.5-7 micrometers are especially desirable.

[0175] Next, a photosensitive layer is explained.

[0176] Although the mechanical strength improved by leaps and bounds by using the electron hole transportability compound which has two or more chain pile affinity functional groups in the same molecule as a protective layer like the above-mentioned, when a photosensitive layer was an organic system photosensitive layer, sensitivity might not fully be obtained, and elevation of a rest potential might be seen. Moreover, potential was changed with an environmental change and the fully stabilized potential property could not be acquired.

[0177] As a result of inquiring wholeheartedly, between the molecular weight of the charge transportation material in the photosensitive layer which touches a protective layer, sensitivity, remaining electricity, and environmental potential change, this invention persons found out that it was related, and resulted at this invention. That is, the fall of sensitivity and elevation of a rest potential could be suppressed by making or more into 350 molecular weight of the charge transportation material of the photosensitive layer which touches a protective layer, and environmental potential change was also able to be suppressed.

[0178] The mechanism of this invention is considered as follows, although it is not certain. Facing the electron hole transportability compound which has two or more chain pile affinity functional groups in the same molecule carrying out a polymerization by irradiating light and radiation as a protective layer, light and radiation have also reached the photosensitive layer under a protective layer. This light and radiation degrade the charge generating material and charge transportation material in a photosensitive layer, and are considered that a photo conductor property falls. Although degradation by cutting of a molecule produces the charge transportation material with small molecular weight, without the ability distributing the light and the energy of radiation which were absorbed, the charge transportation material with large molecular weight can carry out the light and the energy of radiation which were absorbed under non-localization, stabilization becomes possible by changing into heat energy, and it is thought that degradation is suppressed. Moreover, it is thought that degradation of charge generating material is also suppressed because charge transportation material transforms light and the energy of radiation to heat energy. Therefore, when charge transportation material with large molecular weight is used, it is thought that degradation of the charge generating material by light and radiation and charge transportation material can be suppressed.

[0179] In this invention, it is desirable that the molecular weight of charge transportation material is 700 or less [350 or more]. It is because the inclination for a potential property and environmental variation to get worse is seen probably because solubility will fall, if 700 is exceeded.

[0180] As long as the charge transportation material which the photosensitive layer in this invention contains is 350 or more molecular weight, which thing is sufficient as them. For example, triaryl amine derivatives, such as triaryl alkane derivatives, such as heterocyclic compounds, such as a high molecular compound which has heterocycles and condensation polycyclic aromatic series, such as Polly N-vinylcarbazole and the poly styryl anthracene, and a pyrazoline, an imidazole, an oxazole, a triazole, a carbazole, and a triphenylmethane color, and a triphenylamine, a phenylenediamine derivative, N-phenyl carbazole derivative, a stilbene derivative, a hydrazone derivative, a butadiene derivative, etc. are mentioned.

[0181] The example of a compound and molecular weight of charge transportation material are shown below. Since example No.of compound1-No.11 are less than 350 molecular weight, they

are a compound besides this invention. The charge transportation material used for this invention, of course is not restricted to these.
[0182]
[Formula 111]

[0192] In this invention, charge transportation material other than the charge transportation material whose molecular weight is 350 or more can be added further. however, the charge transportation material whose molecular weight is 350 or more in order to fully acquire the effect of this invention is more than 50 mass % of all the charge transportation material in a photosensitive layer -- desirable -- further -- it is more desirable that it is a 70 mass % not less
[0193] The composition of the electrophotography photo conductor of this invention can also take which monolayer [which consists of a laminating type which carried out the laminating of the charge transporting bed containing the charge generating layer and charge transportation material which contain charge generating material as a photosensitive layer under a protective layer, and a binding resin to this order, and a monolayer which has charge generating material, charge transportation material, and a binding resin in the same layer] type composition.
[0194] Hereafter, a laminating type photosensitive layer is explained.
[0195] The charge transporting bed in this invention can apply the solution which distributed / dissolved charge transportation material with the binding resin at the solvent, and can be dried and formed.
[0196] As a binding resin used with the above-mentioned charge transportation material, the resin for charge transporting beds used conventionally can be used, for example, polyester, a polycarbonate, a polyarylate, a polymethacrylic acid ester, polystyrene, etc. are mentioned. As for the thickness of a charge transporting bed, it is desirable that it is 1-50 micrometers, and it is especially desirable that it is 5-30 micrometers.
[0197] When the ratio of the charge transportation material in this case and the above-mentioned binding resin sets both total mass to 100, as for the mass of charge transportation material, 10-100 are desirable, and are preferably chosen suitably in 20-100.
[0198] Although it is desirable to apply the solution which distributed charge generating material to the binding resin, and to form by drying, you may form the charge generating layer in this invention by carrying out the vacuum evaporationo only of the charge generating material.
[0199] As a charge generating material, the amorphous silicon of a publication etc. is mentioned to a selenium-tellurium, a pyrylium, a thia pyrylium system color, various kinds of central metals and crystal system, the phthalocyanine compound that specifically has crystallized types, such as alpha, beta, gamma, epsilon, and an X type, an anthanthrone pigment, a JIBENZU pyrene quinone pigment, a pyran TRON pigment, a tris azo pigment, a disazo pigment, a monoazo pigment, an indigo pigment, a Quinacridone pigment, an unsymmetrical kino cyanine pigment, a kino cyanine
[0200] 0.3 to 4 times, with the binding resin and solvent of an amount, methods, such as a homogenizer, ultrasonic distribution, a ball mill, a vibration ball mill, a sand mill, attritor, and a roll mill, are sufficient as a charge generating layer, and it distributes the aforementioned charge generating material, applies dispersion liquid, and is dried and formed, or is formed as films of independent composition, such as a vacuum evaporationo film of the aforementioned charge generating material. As for the thickness, it is desirable that it is 5 micrometers or less, and it is especially desirable that it is the range which is 0.1-2 micrometers.
[0201] As for the example in the case of using a binding resin, the polymer and the copolymer,

the polyvinyl alcohol, the polyvinyl acetal, the polycarbonate, the polyester, the polysulfone, the polyphenylene oxide, the polyurethane, a cellulosic resin, phenol resin, melamine resin, silicone resin, an epoxy resin, etc. of vinyl compounds, such as styrene, vinyl acetate, a vinyl chloride, an acrylic ester, a methacrylic ester, a fluoride vinylidene, and truffe RUORO ethylene, are mentioned.

[0202] When a photosensitive layer is a monolayer, the solution which distributed and dissolved the above-mentioned charge generating material and with a molecular weight of 350 or more charge transportation material in the above-mentioned binding resin can be applied, and it can form by drying.

[0203] Various additives can be added in the photosensitive layer in this invention. These additives are degradation inhibitors, such as an antioxidant and an ultraviolet ray absorbent, and a ** agent and others, such as a fluorine atom content resin particle.

[0204] Independent or the metal which applied and prepared the conductive layer with the binding resin, plastic film, paper, etc. are mentioned in the thing and the conductive matter which deposited what laminated metallic foils, such as what fabricated metals and alloys, such as aluminum, copper, chromium, nickel, zinc, and stainless steel, a drum or in the shape of a sheet, aluminum, and copper, in plastic film that what is necessary is just what has conductivity as a base material of an electrophotography photo conductor, aluminum, indium oxide, the tin oxide, etc. to plastic film.

[0205] In this invention, a conductive support surface may be chemically processed by the reaction with a chemical conversion, i.e., an acid, or an alkaline-water solution, and an insoluble coat may be formed.

[0206] On a conductive base material, an under-coating layer with a barrier function and an adhesion function can be prepared. An under-coating layer is formed for an adhesive improvement of a photosensitive layer, coating nature improvement, protection of a base material, covering of the defect on a base material, the charge pouring nature improvement from a base material, the protection to the electrical breakdown of a photosensitive layer, etc.

[0207] As a material of an under-coating layer, for example A polyethylene resin, acrylic resin, Methacrylic resin, polyamide resin, vinyl chloride resin, a vinyl acetate resin, Phenol resin, polycarbonate resin, a polyurethane resin, polyimide resin, A vinylidene chloride resin, a polyvinyl-acetal resin, a vinyl chloride vinyl acetate copolymer, A fusibility Nylon a polyvinyl alcohol resin, water-soluble polyester resin, and alcoholic, A nitrocellulose, casein, gelatin, the poly glutamic acid, starch, Resins, such as starch acetate, amino starch, a polyacrylic acid, and a polyacrylamide, Or independent or two sorts or more can be mixed, and metal organic compounds, such as an organometallic compound containing a silane coupling agent, a zirconium, titanium, aluminum, manganese, etc., can be used. It dissolves in the solvent suitable for each, and these are applied on a base material. As thickness in that case, 0.1-5 micrometers is desirable.

[0208] As the method of application of these each class, although the dip coating method, the spray coating method, the curtain coating method, the spin coating method, etc. are learned for example, the dip coating method from the point of efficiency/productivity is desirable. Moreover, the well-known film production method of of vacuum evaporationo, and plasma and others can choose suitably.

[0209] The outline composition of the electrophotography equipment using the process cartridge which has the electrophotography photo conductor of this invention in drawing 1 is shown.

[0210] In drawing, 1 is the electrophotography photo conductor of a drum-like this invention,

and a rotation drive is carried out with a predetermined peripheral velocity in the direction of an arrow a center [a shaft 2]. In rotation process, the electrophotography photo conductor 1 receives uniform electrification of positive or negative predetermined potential in the peripheral surface by the primary electrification means 3, and receives the exposure light 4 by which the emphasis modulation was subsequently carried out corresponding to the time series electrical-and-electric-equipment digital image signal of image information to be outputted from exposure meanses (un-illustrating), such as slit exposure and laser-beam scanning exposure. In this way, the electrostatic latent image corresponding to the target image information is formed one by one to the peripheral surface of the electrophotography photo conductor 1.

[0211] Subsequently the toner development of the formed electrostatic latent image is carried out by the development means 5, and the toner picture by which formation support is carried out is imprinted one by one by the imprint means 6 on the front face of the electrophotography photo conductor 1 by the imprint material 7 to which was taken out from the non-illustrated feed section and paper was fed between the electrophotography photo conductor 1 and the imprint means 6 from it synchronizing with rotation of the electrophotography photo conductor 1.

[0212] The imprint material 7 which received the imprint of a toner picture is printed out out of equipment as an image formation object (a print, copy) by dissociating from an electrophotography photo conductor side, being introduced to the image fixing means 8, and receiving image fixing.

[0213] The front face of the electrophotography photo conductor 1 after an image imprint is used for repeat image formation, after a pure side is formed by the cleaning means 9 in response to removal of the imprint remaining toner and electric discharge processing is further carried out by the pre-exposure light 10 from a pre-exposure means (un-illustrating). In addition, when the primary electrification means 3 is a contact electrification means using the electrification roller etc., a pre-exposure is not necessarily required.

[0214] In this invention, two or more things may be dedicated to a container 11 among the components of the above-mentioned electrophotography photo conductor 1, the primary electrification means 3, the development means 5, and cleaning means 9 grade, and it may combine with one as a process cartridge, and may constitute, and this process cartridge may be constituted free [attachment and detachment] to main parts of electrophotography equipment, such as a copying machine and a laser beam printer. For example, in support of at least one of the primary electrification means 3, the development means 5, and the cleaning meanses 9, it can cartridge-ize to one with the electrophotography photo conductor 1, and can consider as the process cartridge which can be freely detached and attached on the main part of equipment using the guidance meanses 12, such as a rail of the main part of equipment.

[0215] Moreover, the exposure light 4 is a light irradiated by the scan of a laser beam which reads and signal-izes a manuscript by the reflected light from a manuscript, the transmitted light, or the sensor, and is performed according to this signal, the drive of an LED array, the drive of a liquid crystal shutter array, etc., when electrophotography equipment is a copying machine and a printer.

[0216] It not only uses the electrophotography photo conductor of this invention for an electrophotography copying machine, but it can use it for electrophotography applicable fields, such as a laser beam printer, a CRT printer, an LED printer, FAX, a liquid crystal printer, and laser platemaking, widely.

[0217]

EXAMPLES

[Example] Hereafter, according to an example, this invention is explained still in detail. In addition, the "section" in an example expresses the mass section.

[0218] (Example 1) The paint for conductive layers was first prepared in the following procedures. With the sand-mill equipment using phi1mm glass bead, it distributed for 2 hours and the conductive titanium oxide fine-particles 50 section covered with the tin oxide containing the antimony oxide of 10 mass %, the phenol resin 25 section, the methyl-cellosolve 20 section, the methanol 5 section, and the silicone-oil (poly dimethylsiloxane polyoxyalkylene copolymer, average molecular weight 3000) 0.002 section were prepared. Thickness formed the conductive layer which is 20 micrometers by applying this paint by the dip painting cloth method on a phi30mm aluminum cylinder, and drying for 30 minutes at 140 degrees C.

[0219] Next, the N-methoxymethyl-ized nylon 5 section was dissolved into the methanol 95 section, and the paint for interlayers was prepared. Thickness formed the interlayer who is 0.6 micrometers by applying this paint by the dip coating method on the aforementioned conductive layer, and drying for 20 minutes at 100 degrees C.

[0220] Next, the Bragg angle (2theta**0.2 degree) in characteristic X ray diffraction of CuKalpha distributed the oxy-titanium phthalocyanine which has 9.0 degrees, 14.2 degrees, 23.9 degrees, and a peak strong against 27.1 degrees for 2 hours with the sand-mill [section / cyclohexanone 35 / the three sections, the polyvinyl-butyral (tradename : id REKKU BM 2, Sekisui Chemical Co., Ltd. make) 3 section, and] equipment using phi1mm glass bead, added the ethyl-acetate 60 section after that, and prepared the paint for charge generating layers. Thickness formed the charge generating layer which is 0.2 micrometers by applying this paint by the dip painting cloth method on the aforementioned interlayer, and drying for 10 minutes at 50 degrees C.

[0221] Subsequently, it is the polycarbonate resin 10 section which has the repeat unit of the ten sections and the following structure expression (21) for example No.of compound 54 as a charge transportation material [0222]

[Formula 121]

It dissolved into the mixed solvent of the monochlorobenzene 50 section / dichloromethane 30 section, and the application liquid for charge transporting beds was prepared. Thickness formed the charge transporting bed which is 20 micrometers by carrying out dip coating of this application liquid on the aforementioned charge generating layer, and drying at 110 degrees C for 1 hour.

[0223] Subsequently, the electron hole transportability compound 60 section of example No.of compound 6 was dissolved into the mixed solvent of the monochlorobenzene 50 section / dichloromethane 50 section, and the paint for protective layers was prepared. By applying this paint on a previous charge transporting bed by the spray coating method, irradiating an electron ray on condition that 150kV of acceleration voltage, and dosage 30Mrad, and hardening a resin, thickness formed the protective layer which is 5 micrometers, and obtained the

electrophotography photo conductor.
[0224] LBP-SX by Canon, Inc. was equipped with the produced electrophotography photo conductor, and the initial electrophotography property was evaluated. The early photo conductor property [optical attenuation sensitivity (quantity of light required in order to make -200V carry out optical attenuation by dark space potential-700V setup), and a rest potential Vsl (potential when irradiating the quantity of light 3 times the quantity of light of optical attenuation sensitivity)] was measured and searched for in the environment under ordinary temperature normal-relative-humidity environment (23 degrees C / 50%RH). Then, environment was changed into the bottom (H/H) of high-humidity/temperature (32 degrees C / 85%RH), and the amount of change from under the ordinary temperature normal-relative-humidity environment of Vl (deltaVl) was measured. A result is shown in Table 3.

[0225] (Examples 2-22 and examples 1-4 of comparison) The electrophotography photo conductor was produced and evaluated like the example 1 except having replaced the charge transportation material in the electron hole transportability compound in the protective layer of an example 1, or a photosensitive layer with, as shown in Table 3. The result is shown in Table 3.
[0226] (Example 23) Example No.of compound 54 of the charge transportation material of an example 1 They are the ten sections The example Noof compound.198 section, and example No.of compound 54 The electrophotography photo conductor was produced and evaluated like the example 1 except having replaced with the two sections. A result is shown in Table 4.
[0227] (Example 24) Example No.of compound 54 of the charge transportation material of an example 1 They are the ten sections The example Noof compound.53 section, and example No.of compound 54 The electrophotography photo conductor was produced and evaluated like the example 1 except having replaced with the seven sections. A result is shown in Table 4.
[0228] (Example 25) Example No.of compound 54 of the charge transportation material of an example 1 They are the ten sections The example Noof compound.57 section, and example No.of compound 54 The electrophotography photo conductor was produced and evaluated like the example 1 except having replaced with the three sections. A result is shown in Table 4.
[0229] (Example 26) The photo conductor base material for electrophotography was first obtained in the following procedures. After having prepared phi30mm aluminum cylinder, having maintained at the temperature of 40 degrees C the non clo mate chemical-conversion agent liquid (tradename : PARCO-TO 3753, by Nihon Parkerizing Co., Ltd.) which contains titanium as a phytic acid and a metal as organic phosphoric acid, immersing the above-mentioned aluminum cylinder into this liquid and performing a chemical conversion for 1 minute, the air drying was washed and carried out with pure water, and it considered as the base material.
[0230] The charge generating layer, the charge transporting bed, and the protective layer were formed and evaluated like the example 1 on the above-mentioned base material. A result is shown in Table 4.
[0231] (Examples 27 and 28) The electrophotography photo conductor was produced and evaluated like the example 26 except having replaced example No.of compound 54 of the charge transportation material of an example 26 with example No.of compound 29, and example No.of compound 68. A result is shown in Table 4.
[0232] (Example 29) Honing processing of the phi30mm aluminum cylinder was carried out, and what carried out ultrasonic backwashing by water was made into the conductive base material.

[0233] Next, the 85% butanol solution (Kanto chemistry company make) 64 section (0.06 mols) of zirconium tetrapod-n-butoxide and the titanium tetrapod-n-butoxide (KISHIDA chemistry company make) 22 section (0.14 mols) are dropped at the methoxy ethanol 160 section, and the mixed solution of the methoxy ethanol / pure water =160 section / 11 section is added further. Furthermore, after the solution which added the acetylacetone 20 section to the methanol 200 section was dropped, thickness formed the interlayer who is 0.3 micrometers by carrying out the dip painting cloth of the interlayer application liquid which mixed and obtained the 10 mass % methanol liquid 55 section of hydroxypropylcellulose (the Tokyo Chemicals industrial company make) on an aluminum cylinder base material, and carrying out stoving for 15 minutes at 120 degrees C.

[0234] The charge generating layer, the charge transporting bed, and the protective layer were formed and evaluated like the example 1 on the above-mentioned interlayer. A result is shown in Table 4.

[0235] (Examples 30 and 31) The electrophotography photo conductor was produced and evaluated like the example 29 except having replaced example No.of compound 54 of the charge transportation material of an example 29 with example No.of compound 32, and example No.of compound 40. A result is shown in Table 4.

[0236] (Example 32) The electrophotography photo conductor was produced and evaluated like the example 2 except having prepared the application liquid for charge transporting beds as follows. A result is shown in Table 4.

[0237] Example No.of compound 54 of charge transportation material The 16 sections, the polycarbonate resin 4 section which has the repeat unit of the aforementioned structure expression (21), and the antioxidant (tradename : IRUGA NOx 1330, product made from Ciba-Geigy) 1 section were dissolved into the mixed solvent of the monochlorobenzene 50 section / dichloromethane 30 section, and the application liquid for charge transporting beds was prepared.

[0238] (Example 33) The electrophotography photo conductor was produced and evaluated like the example 1 except having prepared the application liquid for charge transporting beds as follows. A result is shown in Table 4.

[0239] Example No.of compound 98 of charge transportation material The three sections and example No.of compound 89 The one section, the polycarbonate resin 16 section which has the repeat unit of the aforementioned structure expression (21), the antioxidant (tradename : SumilizerGS, Sumitomo Chemical Co., Ltd. make) 0.5 section, and the antioxidant (tradename : IRGAFOS- 168, Ciba-Geigy Japan make) 0.5 section were dissolved into the mixed solvent of the monochlorobenzene 50 section / dichloromethane 30 section, and the application liquid for charge transporting beds was prepared.

[0240] When with a molecular weight of less than 350 charge transportation material was used to a potential property and environmental capability being good if with a molecular weight of 350 or more charge transportation material is used as shown in the example of comparison as shown in the example of Table 3 and 4, there were some which produced a sensitivity fall and elevation of a rest potential, and there was also a big thing of environmental variation.

[0241]

[Table 3]

[0242]
[Table 4]

[0243]
[Effect of the Invention] According to this invention, electrophotography properties, like sensitivity is good, there is little elevation of a rest potential, and the potential change by environment is small are very good, and were able to offer the electrophotography photo conductor which can demonstrate the always stabilized performance.
[0244] Moreover, naturally the effect of the above-mentioned electrophotography photo conductor is demonstrated also in the process cartridge and electrophotography equipment which have the electrophotography photo conductor, and high definition is maintained for a long period of time.

PRIOR ART

[Description of the Prior Art] Conventionally, inorganic photoconductivity material, such as a selenium, a cadmium sulfide, and a zinc oxide, was widely used for the electrophotography photo conductor. On the other hand, as an electrophotography photo conductor using an organic photoconductivity material, they are the photoconductivity polymer represented by Polly N-vinyl caliber ZORU and 2 and 5-screw (p-diethylaminophenyl). - 1, 3, the thing using a low-molecular organic photoconductivity material like 4-OKISA diazole, the thing that combined this organic photoconductivity material, various colors, and pigment are known further.

[0003] Since the electrophotography photo conductor using an organic photoconductivity material is good and membrane formation nature can produce it by coating, it has the advantage which productivity can provide with a cheap high electrophotography photo conductor extremely. Moreover, it had the advantage with a sensitization wavelength region controllable free by selection of a color, a pigment, etc. to be used, and a broad examination has so far been made. The improvement remarkable in the sensitivity and endurance which carried out the laminating of the charge generating layer which especially contained the organic photoconductivity color and the pigment recently, and the charge transporting bed containing photoconductivity polymer or a low-molecular organic photoconductivity material and which were made the fault of the conventional organic electrophotography photo conductor by development of the electrophotography photo conductor of a functional discrete type is made, and this is becoming in use [an organic electrophotography photo conductor].

[0004] On the other hand, it is required the sensitivity according to the electrophotography process applied to an electrophotography photo conductor with a natural thing, the electrical property, and that it should have the optical property further. If it is in the electrophotography photo conductor by which repeat use is carried out especially, electric and since mechanical force external is applied directly, endurance over them, such as an imprint to electrification, picture exposure, a toner development, and paper and cleaning processing, is required of the electrophotography photo conductor front face. Specifically, surface degradation by the endurance and electrification over the surface wear and generating of a blemish by **** is mentioned, and the fall of imprint efficiency or slipping nature and the endurance over degradation of electrical properties, such as a sensitivity fall and a potential fall, are also required further in more detail.

[0005] Generally, the front face of an electrophotography photo conductor is a thin resin layer, and the property of a resin is very important for it. Although it considers as the resin with which it is satisfied of above-mentioned terms and conditions to some extent and acrylic resin, polycarbonate resin, etc. are put in practical use in recent years, when it is not satisfied [with these resins] of all the properties that were mentioned above and it attains high durability-ization of an electrophotography photo conductor especially, it is hard to say that the coat degree of hardness of this resin is sufficiently high. Even when these resins were used as a resin for surface-layer formation, wear of a surface layer took place repeatedly at the time of use, and there was a trouble that a blemish occurred further.

[0006] Furthermore, although low molecular weight compounds, such as charge transportation material, are added in many cases comparatively in large quantities from the demand to high-sensitivity-izing of an organic electrophotography photo conductor in recent years, film intensity

falls remarkably by the operation like a plasticizer of these low-molecular-weight material in this case, and wear and blemish generating of the surface layer at the time of repeat use pose a problem further. Moreover, when saving an electrophotography photo conductor over a long period of time, the above-mentioned low molecular weight constituent deposited, and the problem of carrying out layer separation is also generated.

[0007] As a means to solve these troubles, the attempt which uses the resin of hardenability as a resin for charge transporting beds is indicated by JP,2-127652,A etc. Thus, ******-proof and ****-proof at the time of the increase of a mechanical strength and repeat use improve greatly by using the resin of hardenability for the resin for charge transporting beds, hardening a charge transporting bed and constructing a bridge. However, even if it uses a hardenability resin, since a low molecular weight constituent acts as a plasticizer into a binding resin to the last, the problem of a deposit which was described previously, or layer separation is not fundamental solution.

[0008] Moreover, in the charge transporting bed which consists of an organic charge transportation material and a binding resin, by the time it satisfies both -- charge transportation ability is not enough and the rise of a rest potential is seen at the time of repeat use -- to a hardenability resin with a degree of hardness high enough greatly [the dependence over the resin of charge transportation ability], it will not have resulted.

[0009] Moreover, it sets to JP,5-216249,A, JP,7-72640,A, etc. Although the electrophotography photo conductor which the charge transfer layer was made to contain the monomer which has a carbon-carbon double bond, was made to react by the carbon-carbon double bond, heat, or luminous energy of charge transfer material, and formed the charge transfer layer hardening film is indicated, since charge transportation material is only fixed by the polymer main frame in the shape of a pendant and cannot fully eliminate a previous plastic operation, a mechanical strength is not enough. Moreover, if concentration of charge transportation material is made high for improvement in charge transportation ability, crosslinking density cannot become low and cannot secure sufficient mechanical strength. Furthermore, we are anxious also about the influence on the electrophotography property of initiators needed at the time of a polymerization.

[0010] Moreover, it sets to JP,8-248649,A etc. as another solution means. although it is effective to a deposit or layer separation as compared with a conventional molecular-dispersion type charge transporting bed although the electrophotography photo conductor which the basis which has charge transportation ability was introduced [photo conductor] and made the charge transporting bed form into a thermoplastic macromolecule principal chain is indicated, and a mechanical strength also improves, it is thermoplastics to the last, and there is a limitation in the mechanical strength and it is hard to say that it enough-comes out in respect of the handling including the solubility of a resin etc., or productivity

[0011] Making into the background what was described above, this invention persons repeated the examination for attaining coexistence of a high mechanical strength and charge transportation ability. Consequently, it was checked that coexistence of a mechanical strength and charge transportation ability is mostly attained with the electrophotography photo conductor containing the compound to which the polymerization of the electron hole transportability compound which has two or more chain pile affinity functional groups in the same molecule was carried out.

[0012] However, although the mechanical strength improved by using the electron hole transportability compound which has two or more chain pile affinity functional groups in the same molecule when this was used as a protective layer, when a photosensitive layer was an organic system photosensitive layer, sensitivity might not fully be obtained and the rise of a rest

potential might be seen. Moreover, potential was changed with an environmental change and the stable potential property could not be acquired.
[0013] In order to offer the more excellent electrophotography photo conductor with high-definition-izing in recent years and a raise in durability, these problems surely needed to be solved.

EXAMPLE

[Example] Hereafter, according to an example, this invention is explained still in detail. In addition, the "section" in an example expresses the mass section.
[0218] (Example 1) The paint for conductive layers was first prepared in the following procedures. With the sand-mill equipment using phi1mm glass bead, it distributed for 2 hours and the conductive titanium oxide fine-particles 50 section covered with the tin oxide containing the antimony oxide of 10 mass %, the phenol resin 25 section, the methyl-cellosolve 20 section, the methanol 5 section, and the silicone-oil (poly dimethylsiloxane polyoxyalkylene copolymer, average molecular weight 3000) 0.002 section were prepared. Thickness formed the conductive layer which is 20 micrometers by applying this paint by the dip painting cloth method on a phi30mm aluminum cylinder, and drying for 30 minutes at 140 degrees C.
[0219] Next, the N-methoxymethyl-ized nylon 5 section was dissolved into the methanol 95 section, and the paint for interlayers was prepared. Thickness formed the interlayer who is 0.6 micrometers by applying this paint by the dip coating method on the aforementioned conductive layer, and drying for 20 minutes at 100 degrees C.
[0220] Next, the Bragg angle (2theta**0.2 degree) in characteristic X ray diffraction of CuKalpha distributes the oxy-titanium phthalocyanine which has 9.0 degrees, 14.2 degrees, 23.9 degrees, and a peak strong against 27.1 degrees for 2 hours with the sand-mill [section / cyclohexanone 35 / the three sections, the polyvinyl-butyral (tradename : S REKKU BM 2, Sekisui Chemical Co., Ltd. make) 3 section, and] equipment using phi1mm glass bead. The ethyl-acetate 60 section was added after that, and the paint for charge generating layers was prepared. Thickness formed the charge generating layer which is 0.2 micrometers by applying this paint by the dip painting cloth method on the aforementioned interlayer, and drying for 10 minutes at 50 degrees C.
[0221] Subsequently, the polycarbonate resin 10 section which has the repeat unit of the ten sections and the following structure expression (21) for example No.of compound 54 as a charge transportation material [0222]
[Formula 121]

It dissolved into the mixed solvent of the monochlorobenzene 50 section / dichloromethane 30 section, and the application liquid for charge transporting beds was prepared. Thickness formed

the charge transporting bed which is 20 micrometers by carrying out dip coating of this application liquid on the aforementioned charge generating layer, and drying at 110 degrees C for 1 hour.

[0223] Subsequently, the electron hole transportability compound 60 section of example No.of compound 6 was dissolved into the mixed solvent of the monochlorobenzene 50 section / dichloromethane 50 section, and the paint for protective layers was prepared. By applying this paint on a previous charge transporting bed by the spray coating method, irradiating an electron ray on condition that 150kV of acceleration voltage, and dosage 30Mrad, and hardening a resin, thickness formed the protective layer which is 5 micrometers, and obtained the electrophotography photo conductor.

[0224] LBP-SX by Canon, Inc. was equipped with the produced electrophotography photo conductor, and the initial electrophotography property was evaluated. The early photo conductor property [optical attenuation sensitivity (quantity of light required in order to make -200V carry out optical attenuation by dark space potential-700V setup), and a rest potential Vsl (potential when irradiating the quantity of light 3 times the quantity of light of optical attenuation sensitivity)] was measured and searched for in the environment under ordinary temperature normal-relative-humidity environment (23 degrees C / 50%RH). Then, environment was changed into the bottom (H/H) of high-humidity/temperature (32 degrees C / 85%RH), and the amount of change from under the ordinary temperature normal-relative-humidity environment of Vl (deltaVl) was measured. A result is shown in Table 3.

[0225] (Examples 2-22 and examples 1-4 of comparison) The electrophotography photo conductor was produced and evaluated like the example 1 except having replaced the charge transportation material in the electron hole transportability compound in the protective layer of an example 1, or a photosensitive layer with, as shown in Table 3. The result is shown in Table 3.

[0226] (Example 23) Example No.of compound 54 of the charge transportation material of an example 1 They are the ten sections The example Noof compound.198 section, and example No.of compound 54 The electrophotography photo conductor was produced and evaluated like the example 1 except having replaced with the two sections. A result is shown in Table 4.

[0227] (Example 24) Example No.of compound 54 of the charge transportation material of an example 1 They are the ten sections The example Noof compound.53 section, and example No.of compound 54 The electrophotography photo conductor was produced and evaluated like the example 1 except having replaced with the seven sections. A result is shown in Table 4.

[0228] (Example 25) Example No.of compound 54 of the charge transportation material of an example 1 They are the ten sections The example Noof compound.57 section, and example No.of compound 54 The electrophotography photo conductor was produced and evaluated like the example 1 except having replaced with the three sections. A result is shown in Table 4.

[0229] (Example 26) The photo conductor base material for electrophotography was first obtained in the following procedures. After having prepared phi30mm aluminum cylinder, having maintained at the temperature of 40 degrees C the non clo mate chemical-conversion agent liquid (tradename : PARCO-TO 3753, by Nihon Parkerizing Co., Ltd.) which contains titanium as a phytic acid and a metal as organic phosphoric acid, immersing the above-mentioned aluminum cylinder into this liquid and performing a chemical conversion for 1 minute, the air drying was washed and carried out with pure water, and it considered as the base material.

[0230] The charge generating layer, the charge transporting bed, and the protective layer were

formed and evaluated like the example 1 on the above-mentioned base material. A result is shown in Table 4.

[0231] (Examples 27 and 28) The electrophotography photo conductor was produced and evaluated like the example 26 except having replaced example No.of compound 54 of the charge transportation material of an example 26 with example No.of compound 29, and example No.of compound 68. A result is shown in Table 4.

[0232] (Example 29) Honing processing of the phi30mm aluminum cylinder was carried out, and what carried out ultrasonic backwashing by water was made into the conductive base material.

[0233] Next, the 85% butanol solution (Kanto chemistry company make) 64 section (0.06 mols) of zirconium tetrapod-n-butoxide and the titanium tetrapod-n-butoxide (KISHIDA chemistry company make) 22 section (0.14 mols) are dropped at the methoxy ethanol 160 section, and the mixed solution of the methoxy ethanol / pure water =160 section / 11 section is added further. Furthermore, after the solution which added the acetylacetone 20 section to the methanol 200 section was dropped, thickness formed the interlayer who is 0.3 micrometers by carrying out the dip painting cloth of the interlayer application liquid which mixed and obtained the 10 mass % methanol liquid 55 section of hydroxypropylcellulose (the Tokyo Chemicals industrial company make) on an aluminum cylinder base material, and carrying out stoving for 15 minutes at 120 degrees C.

[0234] The charge generating layer, the charge transporting bed, and the protective layer were formed and evaluated like the example 1 on the above-mentioned interlayer. A result is shown in Table 4.

[0235] (Examples 30 and 31) The electrophotography photo conductor was produced and evaluated like the example 29 except having replaced example No.of compound 54 of the charge transportation material of an example 29 with example No.of compound 32, and example No.of compound 40. A result is shown in Table 4.

[0236] (Example 32) The electrophotography photo conductor was produced and evaluated like the example 2 except having prepared the application liquid for charge transporting beds as follows. A result is shown in Table 4.

[0237] Example No.of compound 54 of charge transportation material The 16 sections, the polycarbonate resin 4 section which has the repeat unit of the aforementioned structure expression (21), and the antioxidant (tradename : IRUGA NOx 1330, product made from Ciba-Geigy) 1 section were dissolved into the mixed solvent of the monochlorobenzene 50 section / dichloromethane 30 section, and the application liquid for charge transporting beds was prepared.

[0238] (Example 33) The electrophotography photo conductor was produced and evaluated like the example 1 except having prepared the application liquid for charge transporting beds as follows. A result is shown in Table 4.

[0239] Example No.of compound 98 of charge transportation material The three sections and example No.of compound 89 The one section, the polycarbonate resin 16 section which has the repeat unit of the aforementioned structure expression (21), the antioxidant (tradename : SumilizerGS, Sumitomo Chemical Co., Ltd. make) 0.5 section, and the antioxidant (tradename : IRGAFOS- 168, Ciba-Geigy Japan make) 0.5 section were dissolved into the mixed solvent of the monochlorobenzene 50 section / dichloromethane 30 section, and the application liquid for charge transporting beds was prepared.

[0240] When with a molecular weight of less than 350 charge transportation material was used to a potential property and environmental capability being good if with a molecular weight of 350

or more charge transportation material is used as shown in the example of comparison as shown in the example of Table 3 and 4, there were some which produced a sensitivity fall and elevation of a rest potential, and there was also a big thing of environmental variation.
[0241]
[Table 3]

[0242]
[Table 4]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is drawing showing the example of the outline composition of the electrophotography equipment using the process cartridge which has the electrophotography photo conductor of this invention.
[Description of Notations]
1 Electrophotography Photo Conductor
2 Shaft
3 Electrification Means
4 Exposure Light
5 Development Means
6 Imprint Means
7 Imprint Material
8 Fixing Means
9 Cleaning Means
10 Pre-exposure Light
11 Process Cartridge Container
12 Guidance Means